

Notice of Allowability

Application No.

10/805,705

Examiner

Henry S. Hu

Applicant(s)

WINEY ET AL.

Art Unit

1713

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to RCE of March 27, 2007.
2. ☒ The allowed claim(s) is/are 1-3, 5-31, 33-45, 59 and 60.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some* c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
- (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
- 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
- (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08),
Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit
of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413),
Paper No./Mail Date _____
7. ☐ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____

DETAILED ACTION

1. This Office Action is in response to **Amendment** along with its **RCE** filed on March 27, 2007. **Claims 1 and 59-60 were amended**; Claim 4 was cancelled, while no claim was added. To be specific, three parent claims including Claim 1, 59 and 60 were amended as: (A) to remove the improper use of "at least a portion of" so as to overcome 112-2nd paragraph claim rejection (for Claim 1), and (B) to incorporate the limitation from dependent Claim 4 so that nanotubes are first mixed into said polymer melt prior to completely removing said vaporized liquid from said nanotube composite melt (for Claims 1, 59 and 60).

The Examiner thereby withdraws 112-2nd paragraph claim rejection for parent Claim 1. The Examiner now accepts the **drawing with six figures** filed along with this application on March 22, 2004 (a brief description for drawing is on page 3). **Claims 1-3, 5-31, 33-45 and 59-60** with **three** independent claims (Claim 1, Claim 59 and Claim 60) are now pending. An action follows.

2. Claim rejections under **Final** Office Action filed on September 27, 2006 are now removed for the reasons given in paragraphs 3-11 thereafter.

Allowable Subject Matter

3. Claims 1-3, 5-31, 33-45 and 59-60 are allowed.

4. The following is an examiner's statement of reasons for allowance: The above Claims 1-3, 5-31, 33-45 and 59-60 are allowed over the closest references:

5. The limitation of parent **Claim 1** in present invention relates to a process, comprising four steps including:

(A) *providing a nanotube dispersion comprising a plurality of nanotubes and a liquid;*

(B) *contacting said nanotube dispersion with a polymer melt;*

(C) *mixing said nanotube dispersion with said polymer melt to provide a nanotube composite; and*

(D) *removing vaporized liquid from said nanotube composite melt.*

Other two independent **Claims 59 and 50** are related to the process of original **Claim 1** but using sonicated mixing for a specific nanotube and a specific solvent. See other limitations of dependent **Claims 2-3, 5-31 and 33-45**.

6. Applicants have now claimed in twice-amended three independent **Claims 1, 59 and 60** an unexpected way of producing a nanotube/polymer composite melt by two key steps as: contacting a nanotube dispersion with a polymer melt and removing vaporized liquid from said nanotube composite melt. The step sequence is critical. In a very close examination, other two independent **Claims 59 and 50** are related to the process of "original Claim 1" but using "sonicated type mixing" for a specific nanotube and a specific solvent so as to form a substantially homogeneous nanotube dispersion.

7. Both 103 rejections by **McAllister** in view of either **Shambaugh** or **Lobovsky** cannot stand by this RCE amendment since Applicants' process is considerably more complicated than simply adding fillers to polymer (see pages 8-9 of Remarks). **The step of using nanotube in the form as liquid dispersion and also using polymer in the melt form for mixing is not disclosed or suggested.** As well known in the art, the aid of liquid medium certainly results at least somewhat different result in the mixing of polymer and nanotube. Two components including polymer melt and nanotube may not be as compatible as three components with existence of liquid medium. Certainly, the function of liquid medium is critical for polymer melt. A hindsight reconstruction is thereby used. In summary, the motivation to link is indeed missing for 103 rejections.

8. Primary reference **McAllister** only discloses a process to prepare a composite of a **particulate-filled microporous thermoplastic polymer shaped article**, which may be in the form of a film, a fiber, or a tube (abstract, line 1-9). The process may comprise **six continuous steps** (a) – (f) as specified on column 5, line 12-34. Particulate particles in the submicron or low micron size can be effectively used as long as they are capable of forming a colloidal dispersion **with the compatible liquid**. **McAllister** is now for this RCE at least silent about three things as: (A) using nanotube as filler, (B) using the polymer in the form of melt and (C) removing vaporized liquid from said nanotube composite melt.

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9. In a very close examination, each of secondary references including **Shambaugh and Lobovsky** has individually disclosed that nanotube as filler can be effectively dispersed in a matrix material (polymeric resin) and the preparation can be without a solvent. By doing so, such a nanotube/solvent/ matrix mixture can be directly used to form a composite material for some “melt applications” such as a draw fiber with special properties for special applications (see “556” at abstract, line 1-4; see “628” at abstract, line 1-9). However, none of the references in combination or alone discloses or suggests the claimed two steps including: step (B) for contacting a nanotube dispersion with a polymer melt and step (D) for removing vaporized liquid from said nanotube composite melt. As exactly pointed out by Applicants on page 8 at bottom section of Remarks, **McAllister is directed to removing liquids by different sequence and different way, such as by extraction from cooled, solidified polymer articles.** Therefore, the reference’s process in combination or alone is quite different from the process of instant application.

Additionally, the present invention has shown **unexpected results** in examples along with some comparative examples for making such a nanotube/polymer composite melt (see pages 12-23 for examples, comparative examples along with Tables 1-3). Therefore, all the above-mentioned references, in combination or alone, does not teach or fairly suggest the limitations of present invention.

10. After further examination and search, the examiner found the following prior art did not teach the claimed limitation:

US 6,900,264 B2 to Kumar et al. only discloses a composition comprising dispersed carbon nanotubes aligned with rigid-rod polymers. **It is achieved by in-situ polymerization in the presence of the carbon nanotubes**, which may be single-wall or multi-wall or combination (abstract, line 1-18). Such a process does not involve melt mixing a molten polymer with a liquid dispersion of carbon nanotubes and a liquid medium (see column 3, line 8-11). Therefore, Kumar fails to teach or fairly suggest the melt process of present invention.

11. The key issue on the process of making such a nanotube/polymer composite melt, two key sequential steps are missing as: **contacting a nanotube dispersion with a polymer melt and removing vaporized liquid from said nanotube composite melt**, therefore, the present invention is novel.

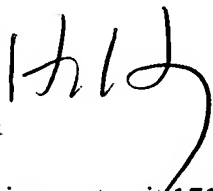
12. As of the date of this office action, the examiner has not located or identified any reference that can be used singularly or in combination with another reference including the above references to render the present invention anticipated or obvious to one of the ordinary skill in the art. Therefore, the three independent and parent process **Claims 1, 59 and 60** are allowed for the reason listed above. Since the prior art of record fails to teach the present invention, the remaining pending dependent **Claims 2-3, 5-31 and 33-45** are passed to issue.

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13. Any inquiry concerning this communication or earlier communication from the examiner should be directed to **Dr. Henry S. Hu** whose telephone number is **(571) 272-1103**. The examiner can be reached on Monday through Friday from 9:00 AM –5:00 PM.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Wu, can be reached on (571) 272-1114. The fax number for the organization where this application or proceeding is assigned is **(571) 273-8300** for all regular communications.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


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May 28, 2007


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